HATCHERY EVALUATION REPORT

Bonneville Hatchery - Coho

December 1996

Integrated Hatchery Operations Team (IHOT)

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Bonneville Hatchery - Coho

An Independent Audit Based on Integrated Hatchery Operations Team (IHOT) Performance Measures

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Section 1

Executive Summary

This report presents the findings of the independent audit of the Bonneville Hatchery - Coho program. The hatchery is located on the Columbia River just west of Cascade Locks, Oregon. The hatchery is used for adult collection, incubation, and rearing of Tule Fall Chinook and URB Fall Chinook and the adult collection and acclimation of coho.

The audit was conducted in 1996-1997 as part of a 2-year effort that will include 67 hatcheries and satellite facilities located on the Columbia and Snake River system in Idaho, Oregon, and Washington. The hatchery operating agencies include the U.S Fish and Wildlife Service, Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, and Washington Department of Fish and Wildlife.

Background

The audit is being conducted as a requirement of the Northwest Power Planning Council (NPPC) "Strategy for Salmon" and the Columbia River Basin Fish and Wildlife Program. Under the audit, the hatcheries are evaluated against policies and related performance measures developed by the Integrated Hatchery Operations Team (IHOT). IHOT is a multi-agency group established by the NPPC to direct the development of new basinwide standards for managing and operating fish hatcheries. The Bonneville Power Administration (BPA) contracted with Montgomery Watson to act as an independent contractor for the audit.

IHOT has established five basic policies that cover: (1) hatchery coordination, (2) hatchery performance standards, (3) fish health, (4) ecological interaction, and (5) genetics. The audit focuses on all these policies, with the exception of hatchery coordination. These policies are set forth in *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1995).* That document is the source for the performance measures that are the basis of this audit.

The Audit Process

The audit was based on the facility management's response to a 109-page questionnaire. This audit form was completed through a five-step process in which:

- Information was obtained from headquarters.
- The hatchery manager was asked to fill out and return the audit form.
- A 1-2 day site audit visit was conducted to inspect facilities, review hatchery records, discuss audit form responses, and develop remedial action plans.
- A compliance report was developed to document the compliance status of each performance measure. This report was then shared with the hatchery manager and IHOT representative.
- This hatchery evaluation report was written to document compliance with IHOT performance measures and develop cost estimates for remedial actions when needed.

Bonneville Hatchery - Coho Results

The Bonneville Hatchery facility includes 4 adult holding ponds, 30 converted Burrows ponds, 30 raceways, and incubation facilities. Bonneville Hatchery was constructed in 1909 and was originally funded by the State of Oregon. In 1957 the facility was remodeled and expanded as part of the Columbia River Fisheries Development Program (Mitchell Act) -- a program to enhance declining fish runs in the Columbia River Basin. The hatchery underwent another renovation in 1974 as part of the U.S. Army Corps of Engineer's mitigation of fish losses from the construction of the John Day Dam.

The Bonneville Hatchery - Coho program was in general compliance with most of the performance measures. In the area of program objectives, the hatchery was not meeting its adult return goal. The audit found that the hatchery was not in compliance with the pathology-free water criteria, water quality monitoring requirements, and IHOT QA/QC protocols for feed, which are all facilities requirements. The hatchery needs to develop specific rearing standards for the IHOT Operations Plan, develop smolification goals and monitoring program, and follow IHOT transportation and sanitation protocols. The hatchery did not have a Genetics Monitoring and Evaluation Program.

The specific areas in which the Bonneville Hatchery - Coho program requires remedial actions based on the IHOT performance measures are listed below. These remedial actions are listed in alphabetical order without intent of ranking or otherwise assigning priority:

- Develop Genetics M&E program
- Develop smolt-to-adult survival goal for IHOT Operations Plan
- Develop smoltification criteria for IHOT and implement measurement program
- Develop written broodstock collection plan and procedures
- Develop written rearing practices and standards for IHOT Operations Plan
- Follow IHOT recommendations for equipment and rain gear sanitation
- Follow IHOT recommendations for monitoring food production
- Follow IHOT transportion protocols
- Improve conditions in ponds used for acclimation
- Review the need for pathogen-free water for rearing and acclimation
- Review Operations Plan with staff
- Run analysis for alkalinity and hardness for Tanner Creek
- Run analysis for contaminants for Tanner Creek
- Run analysis for dissolved oxygen and dissolved nitrogen
- Run analysis for missing water chemistry parameters for Tanner Creek
- Run analysis for nitrite for Tanner Creek
- Run analysis for turbidty for Tanner Creek

Non-compliance issues resulting from items beyond human control or Performance Measures not relevant to this hatchery (Type 1 in Table 3, Section 4 of this report) were not listed above.

Section 2

Facility Description

Name: Bonneville Hatchery

Stock/Species: Tule Fall Chinook, URB Fall Chinook, Spring Chinook, and Coho

Operating Agency: Oregon Department of Fish and Wildlife

Funding Agency: Receives funding from both the National Marine Fisheries Service (NMFS) and U.S. Army Corps of Engineers (COE)

Location: Just west of Cascade Locks, Oregon at Bonneville Dam on the Columbia River

Address:
Bonneville Hatchery
Oregon Department of Fish and Wildlife
Star Route B, Box 12
Cascade Locks, OR 97014

Hatchery Manager: Mr. Dan Barrett

Phone (503) 374-8393
Fax: (503) 374-8090 (fax)

Purpose: Bonneville Hatchery was constructed in 1909 and was originally funded by the State of Oregon. In 1957 the facility was remodeled and expanded as part of the Columbia River Fisheries Development Program (Mitchell Act), a program to enhance declining fish runs in the Columbia River Basin. The hatchery underwent another renovation in 1974 as part of the U.S. Army Corps of Engineer's mitigation of fish losses from the construction of the John Day Dam.

This hatchery provides fish for the ocean and river fisheries and eggs to other programs.

Production Goal:

URB Fall Chinook

2,900,000 eggs to Umatilla Hatchery
2,830,000 fingerlings (37,875 lb) for release in the Columbia
5,325,000 smolts and fingerlings (112,750 lb) for on-station releases
225,000 smolts (28,125 lb) for release in the Umatilla River

Tule Fall Chinook

9,100,000 fry (34,000 lb) for transfer to Stayton Ponds
7,950,000 fingerlings (123,080 lb) for on-station releases
2,000,000 fingerlings (40,000 lb) for release in Tanner Creek from the Stayton Ponds

Spring Chinook

125,000 Deschutes stock smolts (15,554 lb) for release into the West Fork Hood River

Coho

1,175,00 smolts (90,384 lb) for on-site release

Total Production: 481,769lb

Water Supply: Gravity supply from Tanner Creek
Wells

Facilities:

Incubation:	152 16-tray vertical incubators 60 bulk incubators (space for 10 baskets each)
Adult Holding	Upper Pond (North) - 32,785 cf Upper Pond (South) - 32,785 cf Lower Pond - (Upper Side) - 11,288 cf Lower Pond - (Lower Side) - 14,502 cf
Raceways	Battery A - 22 converted Burrow ponds - 3,188 cf each Battery B - 8 converted Burrow ponds - 3,188 cf each Battery C & D - 30 raceways - 4,000 cf each Adult Holding Ponds - 4 ponds, 91,360 cf total
Satellite Facilities	None

Section 3

Compliance Status

The hatchery audits are based on compliance with written IHOT performance measures. These performance measures are documented in ***Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries*** (referred to as *IHOT 1995* in this report).[1] The purpose of the performance measures is to implement new basinwide policies that provide regional guidelines for operating anadromous hatcheries in the Columbia Basin.

The audit focuses on performance measures for IHOT policies that cover (1) hatchery performance standards, (2) fish health, (3) ecological interaction, and (4) genetics. These performance measures are intended to guide hatchery operations once production is established. For that reason, the hatchery operations audit included broodstock collection, spawning, incubation of eggs, fish rearing and feeding, fish release, equipment maintenance and operations, and personnel training. Production priorities are beyond the scope of this audit.

Based on *IHOT 1995*, a detailed 109-page audit form was developed. The audit form divided the performance measures into six major sections along major program and technical criteria areas. Two additional sections (sections 1 and 8) include general information and expenditure information needed for this Hatchery Evaluation Report and blank forms for additional comments. The following is the basic structure of the IHOT audit form:

Section 1	Performance Measures for General Information and Expenditure Information (PMs General 1-2)
Section 2	Performance Measures for Program Objectives (PMs 1-4)
Section 3	Performance Measures for Facility Requirements (PMs 5-15)
Section 4	Performance Measures for Hatchery Practices (PMs 16-25)
Section 5	Performance Measures for Fish Health Policy (PMs 26-34)
Section 6	Performance Measures for Ecological Interactions (PMs 35-38)
Section 7	Performance Measures for Genetics Policy (PMs 39-43)
Section 8	Blank Forms for Additional Comments

Several performance measures are repeated in various sections of the audit form. These performance measures overlap in *IHOT 1995* and were retained to allow individuals interested in specific portions of the audit (such as Genetics or Fish Health) to determine the compliance status of all performance measures for a given topic in one location. A repeated performance measure is indicated by shaded text.

The Hatchery Audit Process

The hatchery audit will be conducted over a 2-year period that concludes in 1997. At each hatchery, a five-step process was used to complete the overall hatchery audit.

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[1]Integrated Hatchery Operations Team (IHOT) 1995. *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries*, Bonneville Power Administration, Portland, Oregon.

This process consisted of research and onsite visits. The site visit at the Bonneville Hatchery was conducted on October 28, 1996.

The following is the five-step audit process:

1. Information was obtained from headquarters.

2. The hatchery manager was asked to fill out and return the **Audit Form**.

3. A 1-2 day site audit visit was conducted at each hatchery. During that visit an audit team inspected facilities, reviewed hatchery records, discussed audit form responses, and developed remedial action plans when appropriate.

4. During the site visit, the compliance status of each performance measure was discussed with the hatchery manager and IHOT representative. A portion of the Hatchery Evaluation Report was sent to the hatchery manager following the audit visit as a **Compliance Report**. That Compliance Report is Table 2 of this report.

5. Information from steps 1-4 was used to prepare a draft **Hatchery Evaluation Report**. This draft report was submitted to the operating agencies for review of the information used to determine compliance. Based on review and comments, a final Hatchery Evaluation Report was developed. The final report documents the compliance of a particular hatchery with the IHOT performance measures and presents cost estimates to correct any deficiencies.

Compliance Status of Bonneville Hatchery - Coho

The following table includes information on life-stages that are held on this facility for some portion of their rearing cycle (Table 1). For multi-facility programs, summary cost and contribution data is presented at the facility where rearing occurs. For the compliance status relating to performance measures that do not occur at this hatchery, please refer to the Hatchery Evaluation Reports for the hatcheries and stocks listed in Table 1. A check mark (✔) indicates that the specific life-stage is held at this facility.

This section documents the compliance status of the Bonneville Hatchery - Coho program. Each performance measure is presented in a table taken from the audit form (Table 2). The compliance status is identified by the following categories:

- **N/A** (not applicable)
- **Yes** (in compliance)
- **?** (unknown; generally due to unavailability of information to determine compliance)
- **No** (not in compliance).

Remedial actions are suggested for performance measures not in compliance. These remedial actions are grouped into categories and listed in Section 4 of this report, where the cost of the required remedial actions is also presented.

Table 1 Summary Program Information for Bonneville Hatchery - Coho

Component	Location of Adult Holding, Spawning, Incubation, and Rearing					
	Bonneville Hatchery	Cascade Hatchery	Oxbow Hatchery			
Adult Collection	✔					
Adult Holding		✔				
Spawning		✔				
Fertilization		✔				
Incubation						
green-to-eyed		✔				
eyed-to-hatch		✔				
Rearing						
fry		✔				
fingerlings		✔	✔			
smolts			✔			
Acclimation/release	✔					

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
the hatchery programs outlined in a subbasin nagement plan?		✔			Columbia Basin System Planning Production Plan and John Day mitigation; U.S. v. Oregon; Mitchell Act	
ıe hatchery operating under a current hatchery rational plan?		✔			IHOT Operations Plan	
s it understood by staff?				✔		Review operations plan with staff
s it being followed?				✔		Review operations plan with staff
hatchery monitoring and evaluation plan in place?						
Do you have a written monitoring and evaluation plan?		✔			CWT program. Review Missing Production Group Report	
ılt contribution to fisheries, spawning grounds, and chery		✔			Review of records. Missing Production Group Report	
ılt pre-spawning survival as compared with blished goal	✔				At Cascade Hatchery	
-take as compared with established hatchery goal	✔				At Cascade Hatchery	
en-egg to eyed-egg survival as compared with blished goal	✔				At Cascade hatchery	
d-egg to fry survival as compared with established l	✔				At Cascade Hatchery	
to smolt survival as compared with established goal	✔				At Cascade Hatchery	
duction as compared with established goal				✔	Review of records; in compliance 3 out of last 5 years. Mortality during acclimation.	Improve conditions in ponds used for acclimation of coho
cent survival (smolt to adult) as compared with blished goal				✔	No goal established	Develop smolt to adult survival goal for IHOT Operations Plan

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
nber of eggs, fry, fingerlings, smolts, and/or adults neet basinwide needs	✔				Rearing at Cascade Hatchery	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
nperature						
Does your water temperature meet the criteria for spawning?	✔				No spawning at this station	
Does your water temperature meet the criteria for ncubation?	✔				No incubation at this station	
Does your water temperature meet the criteria for earing?		✔			Review of temperature data for Tanner Creek/Discussion	
solved gases						
s the oxygen level near saturation?			✔		No data. No problems experienced	Run analysis for dissolved oxygen and dissolved nitrogen
s the dissolved nitrogen level less than saturation?			✔		No data. No problems experienced	See above
emistry						
mmonia (un-ionized)		✔			Review of one set of data for Tanner Creek/Discussion	
Carbon Dioxide				✔	See above	Run analysis to confirm
Chlorine		✔			See above	
H			✔		No data	Run appropriate analyses for Tanner Creek supply
Copper			✔		No data	See above
Hydrogen Sulfide		✔			Review of one set of data for Tanner Creek/Discussion	
ron		✔			See above	
inc				✔	See above	Unknown
bidity						
Does your turbidity meet the criteria?			✔		No data	Run analysis for turbidity for Tanner Creek

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
alinity and hardness						
Does your alkalinity and hardness meet the criteria?				✔	One sample	Run analysis for turbidity of Tanner Creek
rite						
Does your nitrite meet the criteria?				✔	One sample with “trace” value	Run analysis for Tanner Creek
Contaminants						
ldrin			✔		No data	Run analysis for contaminants
ndrin			✔		No data	See above
Dieldrin			✔		No data	See above
Heptachlor			✔		No data	See above
Chlordane			✔		No data	See above
Methoxychlor			✔		No data	See above
indane			✔		No data	See above
Malathion			✔		No data	See above
uthion			✔		No data	See above
hogens						
What portions of the hatchery have disease-free water?						
Adult holding	✔				Not on station	
Incubation	✔				Not on station	
Early rearing	✔				Not on station	
Rearing		✔			Some; but not enough for total demand	Review IHOT criteria for disease-free water for rearing
Others	✔					

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
rm Systems						
)o the following areas have alarms?						
Intake		✔			Inspection of facilities/Discussion	
Large rearing ponds and adult holding ponds		✔			Inspection of facilities/Discussion	
Raceway headboxes and rearing ponds		✔			Inspection of facilities/Discussion	
Incubation facilities		✔			Inspection of facilities/Discussion	
Quarantine areas and facilities		✔			Inspection of facilities/Discussion	
Water treatment systems	✔				None on station	
Security				✔	Inspection of facilities/Discussion	Install security alarms
ıre there outside systems and buzzers in onsite esidences?		✔			Discussion	
ıre water flow alarms checked daily?		✔			Review of records/Discussion	
ıre all other alarms checked weekly?		✔			Discussion	
; there a log of alarms for emergencies, tests, and ıaintenance requirements?		✔			Review of records/Discussion	
ıre telephone pagers used?				✔	Phones hard-wired to on-site residences	Install telephone pagers
ılt collection and holding facilities						
)o you meet the adult holding criteria?	✔				Adults held at Cascade Hatchery	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ıbation facilities						
'ype 1: _____)o you have an adequate number of units for the verall program?	✔				Eggs incubated at Cascade Hatchery	
'ype 2: _____)o you have an adequate number of units for the verall program?	✔				Eggs incubated at Cascade Hatchery	
ıring facilities						
'ype 1: Adult Holding Ponds)o you have an adequate number of units for the verall program?		✔			Inspection of facilities/Discussion	
'ype 2: _____)o you have an adequate number of units for the verall program?	✔					
'ype 3: _____)o you have an adequate number of units for the verall program?	✔					
eening facilities						
)o you meet the approach velocity criteria?		✔			Data from ODF&W	
ıre the fish screens regularly cleaned?		✔			Data from ODF&W	
)oes the screen mesh meet screen opening criteria?		✔			Data from ODF&W	
ıre rearing containers double screened for fish that hould not be released to adjacent water?	✔				Coho are released in Tanner Creek	
dator control facilities						
ıre your predation control facilities effective?		✔			Losses occur but are tolerable	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
d storage facilities and quality control						
)oes the storage of dry/semi-moist/moist foods dry<12%; semi-moist 12-20%; moist >20% moisture) ollow food manufacturer's recommendations?		✔			Discussion	
)oes a regional quality control officer oversee roduction procedures and monitor:						
Verification by feed manufacturer that ingredients meet specifications?				✔	Discussion with ODF&W regional quality control (QC) officer	Follow IHOT recommendation for monitoring of food production
Ensure feed does not contain unwanted drugs or other additives?				✔	Discussion with ODF&W regional quality control (QC) officer	See above
Analyze ingredients contained in the final food product to ensure that feed specifications have been met?				✔	Discussion with ODF&W regional quality control (QC) officer	See above
ıre the foods stored and handled according to the ollowing criteria?						
Moist pellets should not exceed 10 °F at point of delivery.		✔			Discussion	
Moist pellets should be removed from freezer just prior to feeding.		✔			Discussion	
Do not leave buckets of feed or feed containers outside exposed to light or heat.		✔			Discussion	
Open bags of feed should be fed within 1 to 2 days except when feeding small groups of fish.		✔			Discussion	
Automatic feeder hoppers and bulk storage facilities should be insulated against excessive temperatures (80°F and above).		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ease facilities						
)o the release facilities ensure that fish are not ubjected to adverse conditions?		✔			Discussion	
lution abatement facilities						
)o the pollution abatement facilities meet all federal nd state regulations (or good engineering practice)?		✔			Inspection of facilities/Discussion	
re pollution abatement facilities operated correctly?		✔			Discussion	
nsportation facilities						
re the transport systems adequate to meet IHOT erformance measures for transportation practices?		✔			Inspection of facilities/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
odstock selection practices						
s the donor selection process document attached? (PM 40a)	✔				Existing program; does not apply	
Was the donor selection outline followed in selecting ne hatchery broodstock? (PM #40b-c)	✔				Existing program; does not apply	
wning practices						
Were the appropriate number of spawners, male/female atios, and fertilization protocols used? (PM #42c-g)	✔				Spawning at Cascade Hatchery	
ıbation practices						
specific incubation standards listed in the hatchery rations plan?	✔				Incubation at Cascade Hatchery	
incubation practices written?	✔				See above	
ıbation Type 1: see PM #8) you meet the loading and flow criteria?	✔				See above	
ıbation Type 2: (see PM #8) you meet the loading and flow criteria?	✔				See above	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ıring practices						
specific rearing standards listed in the hatchery rations plan?				✔	Review IHOT Hatchery Operations Plan. Standards and practices not written	Develop written rearing practices and standards for IHOT operations plan
rearing practices written?				✔	See above	
Rearing Unit Type 1: Adult Holding Ponds (see PM #9)						
Do you meet the density and DI criteria?			✔		Review of records/Discussion	See above
Do you meet the Loading and FI criteria?			✔		Review of records/Discussion	See above
Rearing Unit Type 2: (see PM #9)						
Do you meet the density and DI criteria?						
Do you meet the Loading and FI criteria?						
Rearing Unit Type 3: (see PM #9)						
Do you meet the density and DI criteria?						
Do you meet the Loading and FI criteria?						
olt quality						
Do you produce a high quality smolt?				✔	Discussion. Adult holding ponds require rebuilding/modification for smolt use.	Improve rearing conditions in the adult holding ponds through provision of pathogen-free water

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
n health management practices						
re the monthly hatchery monitoring visits being onducted? (PM #26)		✔			Review of records/Discussion	
re the annual broodstock inspections being conducted? PM #27)		✔			Review of records/Discussion	
s there pathogen-free water (PM #5h) and are the anitation procedures being followed? (PM #28)				✔		See PM #28
re the following water quality parameters within riteria? (PM #5a-5g)						
Water temperature		✔			Review of data	
Dissolved gases			✔		No data	See PM #5b
Chemistry				✔	No data for some parameters	See PM #5c
Turbidity			✔		No data	See PM #5d
Alkalinity and hardness				✔	Limited data	See PM #5e
Nitrite				✔	Limited data	See PM #5f
Contaminants			✔		No data	See PM #5g
re rearing standards being followed? (PM #19)				✔	Develop written standards	See PM #19
re egg and fish transfer/release requirements met? PM #31)		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
s hatchery performance meet requirements lined in the regional hatchery policies and in basin and hatchery plans for the following areas?						
cent smoltification						
Do you measure percent smoltification?				✔	Discussion	Develop smoltification criteria for IHOT and implement measurement program
Did you meet the smoltification criteria?			✔		Discussion	See above
ring density (prior to release)						
Did you meet the rearing density criteria just prior to elease?			✔		Discussion	See PM #19
ease condition (at release)						
Did you meet all disease regulations just prior to elease?		✔			Discussion	
nber (at release)						
Did you meet the release number goal?				✔	Discussion	See PM #4g
at release						
Did you meet the size goal?		✔			Discussion	
es of release						
Did you meet the release date goal?		✔			Discussion	
ation of release						
Did you release the fish at the specified location?		✔			Discussion	
fish reared in the subbasin or acclimated in the basin?						
are the fish reared in the subbasin?		✔			Discussion	
are the fish acclimated in the subbasin?		✔			Discussion	
ne release strategy appropriate for the program?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
nsportation facilities						
)o transportation equipment and personnel receive isinfection before and after use?		✔			Discussion	
s the fish tank interior disinfected using a solution of 00 ppm active chlorine for 30 minutes minimum or ormaldehyde gas generation method (relative humidity f 60% for 2 hrs)?				✔		Follow IHOT transportation protocols
Is the exterior of the fish transport vehicle disinfected using high pressure steam (115-130°C), high temperature acid, or with 200 ppm chlorine for 30 minutes?		✔			Discussion	
s the fish transport vehicle (cab) disinfected using 600 pm quaternary ammonia compounds (1.5 ml of 50% tock solution/liter water)?			✔		Uncertain	Follow IHOT transportation protocols
s other equipment disinfected including fish pumps, ets, egg sorters, waders, boots, rain gear, hoses and ther equipment using one of the following solutions?		✔			Discussion	
200 ppm chlorine for 30 minutes 600 ppm quaternary ammonia compound for 30 minutes 200 ppm iodophor solution for 10 minutes		✔			Discussion	
)o personnel wear protective garments when handling sh eggs or cultural water?	✔				N/A to Coho program	
)o the fish transport truck/chassis and tank/unit receive n inspection and service prior to the release season?		✔			Discussion	
s a daily service inspection completed before starting p and leaving for the day?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
nsportation facilities						
)oes the fish transport unit receive an inspection prior) loading?		✔			Discussion	
)oes a pre-loading inspection covering tank water evel, pumps or aerators, oxygen injection system ettings, displacement gauge, and truck loading/hauling ensity tables checked and reviewed occur prior to)ading fish in the transport unit?		✔			Discussion	
)o hauling criteria include checking the fish 45 minutes) 1 hour after loading?		✔			Discussion	
Vhen fish are active and systems are functioning roperly, is the oxygen concentration reduced and ıaintained at approximately 8 ppm?		✔			Discussion	
; water temperature in the transportation unit ıaintained within the 42-48 °F range?		✔			Discussion	
)o fish releasing procedures include the following riteria?						
Releasing the fish at the correct release site or into the correct water body.		✔			Discussion	
Tempering or the difference between the liberation tank and the target water body should not exceed 10°F.		✔			Discussion	
The liberation hose should be angled so that fish gently hit the water. Using a tripod is a method of ensuring the hose will stay at the proper angle.		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
luation practices						
las the hatchery conducted fishery contribution studies):						
Determine the requirements for evaluating and improving management programs?		✔			CWT tagging program	
Develop guidelines that define the geographical area and identify component stocks (hatchery and/or wild) that comprise the management unit?		✔			CWT tagging program	
Develop guidelines that define if the proper stocks of fish are currently being used?		✔			CWT tagging program	
Determine which management units contribute to a specific fishery and the time periods of those contributions?		✔			CWT tagging program	
Determine the relative contributions of the various management units to a specific fishery over the different time periods?		✔			CWT tagging program	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ining practices						
Does the hatchery have a training schedule for its staff?		✔			Discussion	
Does each staff member have a personal training plan approved by a supervisor and reviewed annually?		✔			Discussion	
Does the hatchery routinely exchange training details between other hatcheries and agencies?		✔			Discussion	
Does the hatchery encourage and reward off-duty training of staff?		✔			Discussion	
Does the hatchery conduct monthly staff meetings?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
monthly hatchery monitoring visits being ducted by a qualified fish health specialist as cribed below?						
Conduct visit at least monthly		✔			Based on review of regional lab	
Monitoring conducted by qualified fish health specialist		✔			Based on review of regional lab	
Examine a representative sample of healthy and moribund fish from each lot.		✔			Based on review of regional lab	
Review fish culture practices with hatchery manager.		✔			Based on review of regional lab	
Report finding and results of necropsies on standard form.		✔			Based on review of regional lab	
Recommend appropriate drug or chemical treatment.		✔			Based on review of regional lab	
Summarize fish health status or stock prior to release or transfer to another facility.		✔			Based on review of regional lab	
all of the functions of the hatchery yearly nitoring visits being completed as described below?						
Annually examine each broodstock for the presence of reportable viral pathogens.		✔			Review of records/Discussion	
Annually screen each salmon broodstock for the resence of *Renibacterium salmoninarum*.		✔			Review of records/Discussion	
Conduct inspection by or under the supervision of ualified fish health specialist.		✔			Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ıe hatchery following accepted sanitation cedures?						
ıre there any sources of pathogen-free water, especially or incubation and early rearing?	✔				No incubation/early rearing of Coho	
ıre the hatchery sanitation procedures understood and eing followed as described below?						
Disinfect/water harden eggs in iodophor?	✔				See above	
Are foot baths containing disinfectant placed at the incubation facility's entrance and exit?	✔				See above	
Is equipment and rain gear utilized in broodstock handling or spawning sanitized prior to its use elsewhere in the hatchery?			✔		Sometimes	Follow IHOT recommendations for equipment and rain gear sanitation
Is equipment used to collect dead fish sanitized prior its use in another pond and/or lot of fish?		✔			Discussion	
Is equipment, including vehicles used to transfer fish between facilities, disinfected prior to use with any other fish lots or at any other location?		✔			Discussion	
Are rearing vessels sanitized after fish are removed and prior to introducing a new fish lot or stock?		✔			Discussion	
Are dead fish properly disposed of?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
water quality parameters being followed?						
re the following water quality parameters within riteria? (PM #5a-5g)						
Water temperature		✔			Review of data	
Dissolved gases			✔		No data	See PM #5b
Chemistry				✔	No data for some parameters	See PM # 5c
Turbidity			✔		No data	See PM #5d
Alkalinity and hardness				✔	Limited data	See PM #5e
Nitrite				✔	Limited data	See PM #5f
Contaminants			✔		No data	See PM #5g
o to PM #21						
incubation and rearing standards being followed?						
Are the incubation practices following the IHOT incubation criteria? (PM #18)	✔				Incubation at Cascade Hatchery	
Are the rearing practices following the IHOT criteria? (PM #19)			✔		Discussion	See PM #19
o to rearing practices PM #18-PM #19						
egg and fish transfer/release requirements met?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
he hatchery's program outlined in a subbasin nagement plan? Go to subbasin plan PM #1		✔			Columbia Basin System Planning Production Plan and John Day mitigation; U.S. v. Oregon	
he hatchery operating under a current hatchery rational plan? Go to operational plan PM #2		✔			Review IHOT Operations Plan	
hatchery monitoring and evaluation plan in place? Go to hatchery monitoring and evaluation plan PM #3		✔			M&E program described in IHOT Operations Plan	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
s the hatchery program meet requirements blished in the regional hatchery policies and basin planning documents in the following areas: cies, stock, broodstock collection location, odstock numbers, broodstock collection strategy, spawning and egg-take protocols?						
Does the hatchery program meet the requirements for he following?						
Species protocols (PM #4a)		✔			Discussion	
Stock protocols (PM #4a)		✔			Discussion	
Broodstock collection location protocols (PM #41b)		✔			Discussion	
Broodstock numbers protocols (PM #42c)	✔				Broodstock transfered to Cascade Hatchery	
Broodstock collection strategy protocols (PM #41b-d)		✔			Discussion	
Spawning protocols (PM #42d-e)	✔				Occurs at Cascade Hatchery	
Egg-take protocols (PM #42f-g)	✔				Occurs at Cascade Hatchery	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
s the hatchery's performance meet requirements ined in the regional hatchery policies and in basin and hatchery plans for the following areas: cent smoltification, rearing density, disease dition, and the number, size date(s), and location of ase?						
ercent smoltification (PM #22a1)				✔	No written criteria	See PM #22a1
earing density (PM #22a2)			✔		No written criteria	See PM #22a2
)isease condition (PM #22a3)		✔			Discussion	
Number at release (PM #22a4)		✔			Discussion	
ize at release (PM #22a5)		✔			Discussion	
)ate of release (PM #22a6)		✔			Discussion	
.ocation of release (PM #22a7)		✔			Discussion	
fish reared in the subbasin or acclimated in the basin? PM #22b		✔			Discussion	
ne release strategy appropriate for the program? PM #22c		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
new programs, has a broodstock collection plan n developed?						
s the broodstock collection plan written?	✔				Existing Program; does not apply	
or a non-captive broodstock program:	✔				Existing Program; does not apply	
Was an unbiased, representative sample collected?						
Was the recommended number of broodstock collected?	✔				Existing Program; does not apply	
or a captive broodstock program:						
Were captive brood progeny excluded as donors for propagating the next generation of the captive broodstock program?	✔				Existing Program; does not apply	
Were full-sib crosses avoided?	✔				Existing Program; does not apply	
s the broodstock collection plan understood and being ollowed by staff?	✔				Existing Program; does not apply	
a new program, was the donor selection outline owed in selecting the hatchery broodstock?						
s a donor selection plan written?	✔				Existing Program; does not apply	
Was the donor selection outline followed in selecting ne broodstock?	✔				Existing Program; does not apply	
Was the target stock recommended in the donor election process actually used?	✔				Existing Program; does not apply	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
existing programs, were the broodstock collection cedures followed?						
s the broodstock collection plan written?				✔	No written plan	Develop written broodstock collection plan and procedures
Does the broodstock collection plan follow the uideline:						
Was an unbiased, representative sample collected?		✔			Discussion	
Was the recommended number of broodstock collected?		✔			Discussion	
Were the broodstock collection procedures in hatchery operation plan understood and followed?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
s the appropriate number of spawners, male/female os, and fertilization protocols used?						
ıre the spawning protocols written?	✔				At Cascade Hatchery	
ıre daily or weekly spawning logs available?	✔				At Cascade Hatchery	
Vas the appropriate number of spawners used?	✔				At Cascade Hatchery	
)id you attempt to spawn all collected broodstock and ındomize mating with respect to age class, and other ·aits?	✔				At Cascade Hatchery	
Vas the sex-ratio within the limits given in the erformance standards?	✔				At Cascade Hatchery	
Vere the fertilization protocols followed?	✔				At Cascade Hatchery	
: the hatchery needed to reduce the number of eggs ·tained, was this done by representative sampling of ach male/female cross?	✔				At Cascade Hatchery	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ıere a genetics monitoring and evaluation program lace?						
; a genetics monitoring and evaluation program vailable?				✔		Develop genetics M&E program
)oes the plan address the following elements listed in HOT:						
Does the program have elements needed to meet evaluation goals 1-4?				✔		
Has a qualified geneticist reviewed and endorsed the program (goal 5)?				✔		
Will the program collect the data and maintain the records needed to evaluate compliance on an ongoing basis (goal 5)?				✔		
Is the program understood and followed by staff?				✔		

Section 4

Remedial Actions

Based on the compliance status for each performance measure, remedial actions were developed. The required remedial actions are organized into five categories. The types of categories range across a spectrum from those actions that are beyond human control, to those that require a change in agency policy or procedures, to those that involve a significant capital cost to put in place. The following are the five types of remedial actions identified under phase 1 of the audit:

The Five Types of Remedial Actions

Type	Description
1	Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery
2	Remedial actions requiring changes in agency policies or procedures
3	Remedial actions requiring changes in monitoring coverage or interval
4	Remedial actions requiring significant capital expenditures
5	Remedial actions that may require significant capital expenditures but are not clearly definable at this time

Remedial Actions at Bonneville Hatchery - Coho

This section presents the corrective actions required to bring the Bonneville Hatchery - Coho program into compliance with IHOT performance measures. The remedial actions suggested here are just that, suggestions developed by the Montgomery Watson Audit Team. For some non-compliance areas, other remedial actions could be proposed. The required remedial actions are cross-referenced to each IHOT performance measure that was not in compliance. Where appropriate, the costs associated with the remedial actions are also presented (Table 3).

The cost estimates presented in this section are based on professional experience from similar projects. In most cases, only a lump-sum figure is presented, and detailed take-off lists have not been prepared. The cost estimates are essentially order of magnitude estimates (± 40%).

More importantly, the suggested remedial activities may also present several levels of action. Optional actions have been listed for several problems. These optional actions are desirable for either operational or safety considerations.

Table 3. Remedial Actions Required at Bonneville Hatchery - Coho

Remedial Action Required	Cost	PMs[1]
Type 1 - Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery None		
Type 2 - Remedial actions requiring changes in agency policies or procedures		
Review Operations Plan with staff	----	2
Develop smolt-to-adult survival goal for IHOT Operations Plan	----	4h
Install security alarms	----	6
Install telephone pagers	----	6
Follow IHOT recommendations for monitoring food production	----	12
Develop written rearing practices and standards for IHOT Operations Plan	----	19
Develop smoltification criteria for IHOT and implement measurement program	----	22a1
Follow IHOT transportion protocols	----	23
Follow IHOT recommendations for equipment and rain gear sanitation	----	28
Develop written broodstock collection plan and procedures	----	41
Develop Genetics M&E program	----	43

[1] PMs are performance measures that were extracted from the IHOT 1995 report. The IHOT performance measures are listed in Table 2 (Section 3 of this report) in numerical order.

Remedial Action Required	Cost	PMs[1]
Type 3 - Remedial actions requiring changes in monitoring coverage or interval		
Run analysis for dissolved oxygen and dissolved nitrogen	----	5b
Run analysis for missing water chemistry parameters for Tanner Creek	----	5c
Run analysis for turbidty for Tanner Creek	----	5d
Run analysis for alkalinity and hardness for Tanner Creek	----	5e
Run analysis for nitrite for Tanner Creek	----	5f
Run analysis for contaminants for Tanner Creek	----	5g
Type 4 - Remedial actions requiring significant capital expenditures		
None	----	
Type 5 - Remedial actions that may require significant capital expenditures but are not clearly definable at this time		
Improve conditions in ponds used for acclimation	----	4g
Review need for pathogen-free water for rearing and acclimation	----	5h, 20, 22a2

[1] PMs are performance measures that were extracted from the IHOT 1995 report. The IHOT performance measures are listed in Table 2 (Section 3 of this report) in numerical order.

Section 5

Hatchery Contribution to Fisheries, Spawning Grounds, and Hatcheries

This section presents the audit findings for the Bonneville Hatchery - Coho program contribution of adult fish to fisheries, local fisheries, spawning grounds, and hatcheries. Data is reported by broodyear. A broodyear refers to the adult contribution from the eggs produced from a single group of spawning adults. For some species, this may include fish caught as 2-, 3-, 4-, 5-, and 6-year old fish. Because of the return distribution and data processing delays, the complete adult contribution for a given broodyear may not be available until 4 to 5 years after the fish have been released from the hatchery.

Table 4. Adult Contribution to Fisheries, Spawning Grounds, and Hatcheries: Bonneville Hatchery - Coho

Year	Fisheries[1] (Broodyear)	Spawning Grounds[1] (Broodyear)	Hatchery[1] (Broodyear)	Total Combined Contribution[2] (Broodyear)	Smolt to Adult Survival (percent)
1981					
1982					
1983					
1984					
1985					
1986					
1987				29,395	1.67
1988				51,980	3.15
1989				35,350	2.05
1990				19,155	0.88
1991				25,126	2.26
1992					

[1] Data obtained from Missing Production Groups Annual Report or from the Regional Mark Information System database.

[2] Total combined adult contribution; presented when it is not possible to subdivide the contribution into fisheries, spawning grounds, and hatchery contributions.

Section 6

Annual Operating Expenditures

The level and detail of annual operating expenditures varies widely depending on hatchery, operating agency, and funding source. When provided, expenditures were presented in terms of personnel costs, operating costs (power, feed, supplies), capital costs, indirect costs charged to the federal government, third-party costs, and other costs. These cost components were summed to determine a total hatchery annual cost. Based on discussion with the hatchery manager, the percent of total hatchery costs allocated to a given program was estimated. The total hatchery costs and the percent of hatchery costs allocated to a given program were used to compute the cost of a given program. Table 5 shows the annual operating expenses for the Bonneville Hatchery - Coho program. For programs that occur at more than one facility (as shown on Table 1 in Section 3 of this report), the cost breakdown for the component(s) at each facility is presented in separate tables (Tables 5a and 5b).

Table 5. Annual Operating Expenses: Bonneville Hatchery - Coho [(a)]

Hatchery	1994	1995	1996
1. Bonneville Hatchery (includes Oxbow Hatchery costs)	$81,122	$70,136	$78,118
2. Oxbow Hatchery	$219,959	$143,200	$98,781
3.			
4.			
5.			
Total Program Costs	**$301,081**	**$213,336**	**$176,899**

(a) Includes Cascade Hatchery

The total expenditures for the Bonneville Hatchery are presented in Table 6 by program. The detailed breakdown of program expenditures at this hatchery are presented in separate tables (Tables 6a, and 6b).

Table 6. Annual Operating Expenses - Bonneville Hatchery

Program	1994	1995	1996
1. Coho	$81,122	$70,136	$78,118
2. URB Fall Chinook	$689,534	$596,153	$664,001
3. Tule Fall Chinook	$851,777	$736,424	$820,236
4.			
5.			
Total Hatchery Costs	**$1,622,443**	**$1,402,713**	**$1,562,355**

Table 5a. Annual Operating Expenses: Bonneville Hatchery - Coho

Expenditure Occurring at Bonneville and Cascade Hatcheries

Component	1994	1995	1996
Personnel Costs	$630,358	$546,837	$615,680
Operational Costs	$428,665	$355,640	$419,886
Capital Costs	$31,494	$2,594	$0
Indirect Costs	$231,926	$197,642	$226,789
Lumped Hatchery Costs[1]			
Lumped Third-Party Costs[2]	$300,000	$300,000	$300,000
Total Hatchery Costs	**$1,622,443**	**$1,402,713**	**$1,562,355**
Source of Funds			
Program Production (lb)			
Total Production (lb)			
Program as Percent of Total	5%	5%	5%
Program Costs	**$81,122**	**$70,136**	**$78,118**

[1] When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.
[2] 20 million kwh/year @$0.015 per kwh

Table 5b. Annual Operating Expenses: Bonneville Hatchery - Coho

Expenditure Occurring at Oxbow Hatchery

Component	1994	1995	1996
Personnel Costs	$198,941	$190,665	$185,401
Operational Costs	$156,758	$90,519	$57,624
Capital Costs	$15,821	$2,890	$20,842
Indirect Costs	$68,399	$56,878	$44,825
Lumped Hatchery Costs[1]			
Lumped Third-Party Costs[2]	$0	$0	$0
Total Hatchery Costs	**$439,918**	**$340,952**	**$308,692**
Source of Funds			
Program Production (lb)	46,250	53,748	46,250
Total Production (lb)	91,627	125,332	142,229
Program as Percent of Total	50%	42%	32%
Program Costs	**$219,959**	**$143,200**	**$98,781**

[1] When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.
[2] 20 million kwh/year @$0.015 per kwh

Table 6a. Detailed Expenditures at Bonneville Hatchery by Program

Coho

Component	1994	1995	1996
Personnel Costs	$630,358	$546,837	$615,680
Operational Costs	$428,665	$355,640	$419,886
Capital Costs	$31,494	$2,594	$0
Indirect Costs	$231,926	$197,642	$226,789
Lumped Hatchery Costs[1]			
Lumped Third-Party Costs[2]	$300,000	$300,000	$300,000
Total Hatchery Costs	**$1,622,443**	**$1,402,713**	**$1,562,355**
Source of Funds			
Program Production (lb)			
Total Production (lb)			
Program as Percent of Total	5%	5%	5%
Program Costs	**$81,122**	**$70,136**	**$78,118**

[1] When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.
[2] 20 million kwh/year @$0.015 per kwh

Table 6b. Detailed Expenditures at Bonneville Hatchery by Program

URB Fall Chinook

Component	1994	1995	1996
Personnel Costs	$630,358	$546,837	$615,680
Operational Costs	$428,665	$355,640	$419,886
Capital Costs	$31,494	$2,594	$0
Indirect Costs	$231,926	$197,642	$226,789
Lumped Hatchery Costs[1]			
Lumped Third-Party Costs[2]	$300,000	$300,000	$300,000
Total Hatchery Costs	**$1,622,443**	**$1,402,713**	**$1,562,355**
Source of Funds			
Program Production (lb)			
Total Production (lb)			
Program as Percent of Total	42.5%	42.5%	42.5%
Program Costs	**$689,534**	**$596,153**	**$664,001**

[1] When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.
[2] 20 million kwh/year @$0.015 per kwh

Table 6c. Detailed Expenditures at Bonneville Hatchery by Program

Tule Fall Chinook

Component	1994	1995	1996
Personnel Costs	$630,358	$546,837	$615,680
Operational Costs	$428,665	$355,640	$419,886
Capital Costs	$31,494	$2,594	$0
Indirect Costs	$231,926	$197,642	$226,789
Lumped Hatchery Costs[1]			
Lumped Third-Party Costs[2]	$300,000	$300,000	$300,000
Total Hatchery Costs	**$1,622,443**	**$1,402,713**	**$1,562,355**
Source of Funds			
Program Production (lb)			
Total Production (lb)			
Program as Percent of Total	52.5%	52.5%	52.5%
Program Costs	**$851,777**	**$736,424**	**$820,236**

[1] When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.
[2] 20 million kwh/year @$0.015 per kwh